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TITLE

PUMP

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a pump and in particular to a minimized high pressure pump.

Description of the Related Art

Fig. 1A shows a conventional vane pump. A shaft 111 or magnet (not shown) of a motor 11 rotates blades 12 so that fluid passes through the center of vane 121 and out the output due to the centrifugal force of the blades 12. In Fig. 1A, arrow A shows the direction of fluid out and arrow B shows the direction of fluid in. The intake and output of the pump are not, however, sealed influencing the pump's efficiency.

Fig. 1B shows a conventional piston pump. The motor 11 drives the piston 13 by link 112 to compress fluid in the body. One-way valves control the intake and output of the pump. The link 112, however, wastes transmission energy of the motor 11, decreasing efficiency.

Fig. 1C shows a conventional solenoid-operated pump. When the coil 151 of the solenoid 15 is electrified by alternating current and the conducting plate 16 has 60Hz of vibration frequency, the pump produces 120 HZ of vibration frequency which attracts the membrane 17. The elastic force of the membrane 17 compresses the fluid in the body and one-way valves control the intake and output of the pump. In Fig. 1C, arrow A shows the direction of fluid out and arrow B the direction of fluid in. The attraction produced by the solenoid 15 and the compression

is the elastic force of the membrane 17, is relatively week and may be insufficient for desired applications.

Fig. 1D shows another conventional solenoid-operated pump. When the coil 151 is electrified by direct current, the movable conductor 18 is attracted leftward. When the coil 151 is not electrified, the movable conductor 18 is returns rightward to its original position by the spring 19, driving the piston 13. In Fig. 1D, arrow A shows the direction of fluid out and arrow B shows the direction of fluid in. When the conductor 18 moves leftward, however, it deforms the spring 19, decreasing energy. The resilience of the spring 19 moves conductor 18 rightward. The resilience is initially sufficient, but, in extended rightward position, piston 13 requires maximum thrust, and spring 19 here has the least resilience. In this situation, the pump has insufficient power.

Conventional minimized pumps thus are often unable to provide high energy, high thrust, and high pressure at the same time.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a pump that solves the above mentioned problems.

The pump of the present invention comprises a housing, a conductor, a first coil and a second coil. The housing has an intake and an output. The conductor is movably disposed in the housing. The first coil generates a magnetic force to attract the conductor toward the output when electrified, such that fluid between the conductor and the output flows out of the housing. The second coil generates a magnetic force to attract the conductor toward the intake when electrified, such that

fluid between the intake and the conductor flows between the conductor and the output.

Fluid is taken into the housing and store between the intake and the conductor when the first coil is electrified.

The pump further comprises a first base and a second base, both disposed in the housing. The first coil is wound around the first base and the second coil is wound around the second base. The first and second bases may be electrically insulated.

The pump further comprises entrance and exit valves. The entrance valve is disposed between the intake and conductor, and the exit valve between the conductor and the output. The entrance valve opens and the exit valve closes when the first coil is electrified, and the entrance valve closes and the exit valve opens when the second coil is electrified.

The entrance valve and the exit valve are one-way valves.

The one-way valve mentioned comprises an elastic member, with a ball and barricade connected to the elastic member and the ball disposed therebetween.

An end of the elastic member connects to the conductor, and another end is disposed between the first and second bases.

The elastic member comprises a corrugated portion near the first base's connection to the second base.

The elastic member connects to the second base.

The elastic member may be of rubber, the ball of a steel, and the barricade an aluminum plate with openings.

The housing may be of permeable material, and the pump may further comprise a conducting plate disposed in the housing. The conducting plate may be disposed between the first and second bases.

DESCRIPTION OF THE DRAWINGS

The present invention can be more fully understood by reading the subsequent detailed description in conjunction with the examples and references made to the accompanying drawings, wherein:

Fig. 1A is a schematic diagram of a conventional vane pump;

Fig. 1B is a schematic diagram of a conventional piston pump;

Fig. 1C is a schematic diagram of a conventional solenoid-operated pump;

Fig. 1D is a schematic diagram of another conventional solenoid-operated pump;

Fig. 2A is a schematic diagram of the present invention with first coil electrified;

Fig. 2B is a schematic diagram of the present invention with second coil electrified.

DETAILED DESCRIPTION OF THE INVENTION

Figs. 2A and 2B show a pump of the present invention during operation. The pump includes a housing 21, a conductor 22, a first coil 23 and a second coil 24. The housing 21 has an output 211 and an intake 212. The conductor 22 is movably disposed in the housing 21.

The housing 21 has a first base 25 and a second base 26. The first coil 23 is wound around the first base 25. The second coil 24 is wound around the second base 26. The first base 25 and the second base 26 are electrically insulated, constructed of insulating material.

The housing 21 has an exit valve 27 and an entrance valve 28. The exit valve 27 is disposed between the output 211 and

the conductor 22. The entrance valve 28 is disposed between the intake 212 and the conductor 22.

The exit valve 27 and the entrance valve 28 are both one-way valves. As shown in Fig. 2A, the exit valve 27 includes an elastic member 271, a ball 272 and a barricade 273. The barricade 273 connects to the elastic member 271. The ball 272 is disposed between the elastic member 271 and the barricade 273, and is movable in a small range. One end of the elastic member 271 connects to the conductor 22, and the other end of the elastic member 271 is disposed between the first base 25 and the second base 26, sealing therebetween. As shown in Fig. 2B, the elastic member 271 has a corrugated portion near the first base 25 and the second base 26.

Entrance valve 28 is also a one-way valve. As shown in Fig. 2A, the entrance valve 28 disposed at the intake 212 includes an elastic member 281, a ball 282 and a barricade 283. The barricade 283 connects to the elastic member 281. The ball 282 is disposed between the elastic member 281 and the barricade 283, and is movable in a small range. The elastic member 281 connects to the second base 26.

Elastic members 271 and 281 are of rubber, balls 272 and 282 are of steel, and barricades 273 and 283 are aluminum plates with openings.

Furthermore, the housing 21 is of permeable material, and a conducting plate 29 is disposed in the housing 21. In particular, the conducting plate 29 is disposed between the first base 25 and the second base 26, acting as a circuit therebetween.

As mentioned above, the pump of the present invention can be treated as two sets of concentric solenoids series connected

to form the pump. The housing 21, the first coil 23 and the first base 25 form the first solenoid, and the housing 21, the second coil 24 and the second base 26 form the second solenoid. The conducting plate 29 provides a circuit between the two solenoids. The conductor 22 is the conducting cylindrical piston driven by the two solenoids, both of which repeatedly attract the conductor 22 to provide significant force in both directions. Control of the activity of the two solenoids controls the pump action.

Referring to Fig. 2A, when the first coil 23 is electrified and the second coil 24 not electrified, the conductor 22 is attracted by the magnetic force generated by the first coil 23, moving toward the output 211 until contacting first base 25. At this time, pressure near the output 211 in the housing increases and that near the intake 212 decreases, whereby exit valve 27 closes and entrance valve 28 opens. Thus, fluid between the exit valve 27 and the output 211 is compressed by the exit valve 27 and flows out of the housing 21 along the direction shown by arrow A. Meanwhile, fluid outside the housing 21 flows along the direction shown by arrow B, passes through the entrance valve 28, into the housing 21 and is stored between the entrance valve 27 and the exit valve 28.

Referring to Fig. 2B, when the first coil 23 is not electrified and the second coil 24 electrified, the conductor 22 is attracted by the magnetic force generated by the second coil 24, moving toward the intake 212. At this time, pressure near the output 211 in the housing decreases and that near intake 212 increases, whereby exit valve 27 opens and entrance valve 28 closes. Thus, fluid between the entrance valve 28 and

the conductor 22 is compressed by the conductor 22 and flows between exit valve 27 and output 211.

The procedure disclosed is repeated, that is, the first coil 23 and the second coil 24 are electrified in turn to move the conductor 22 repeatedly in the housing 21, continuing fluid transfer.

Note that one end of elastic member 271 of the exit valve 27 seals the gap between the first base 25 and the second base 26, while the other end is connected to the conductor 22. Thereby, fluid in the housing 22 does not leak through the gap. In other words, fluid flowing both into the housing 22 and out of the housing 22 is controlled along the directions of arrow A or arrow B, passing through entrance valve 28 or exit valve 27 thereby.

Elastic member 271 of the exit valve 27 has a corrugated portion which can expand and contact to conform to conductor 22 during motion.

Accordingly, the advantage of the present invention is the solenoid allowing minimization of the pump, while providing maximum compression energy at the same time. The present invention may utilize at dissipating system in a notebook or a server, variety of minimized compressor and medical equipment.

Finally, while the invention has been described by way of example and in terms of the preferred embodiments, it is to be understood that the invention is not limited to the disclosed embodiments. On the contrary, it is intended to cover various modifications and similar arrangements as would be apparent to those skilled in the art. Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements.